VIEWPOINT

From shop floor to top floor: Making the invisible visible

Abstract

Many modern production plants look pretty similar to those of the last decade. Robotics is commonplace in many industries but there are still a multitude of physical assets working to create something physical. It looks like a factory, sounds like a factory and works like a factory. So it's a factory, right? Wrong.

Today factories are no longer the collection of physical assets. They are a combination of the visible hardware and the invisible electronics, sensors, data storage, processing, software, and connectivity that is fundamentally changing everything about the way in which physical assets are managed. The industry has moved from an age of isolated mechanized machinery and electrical products to be an accumulation of complex cyber-physical systems.

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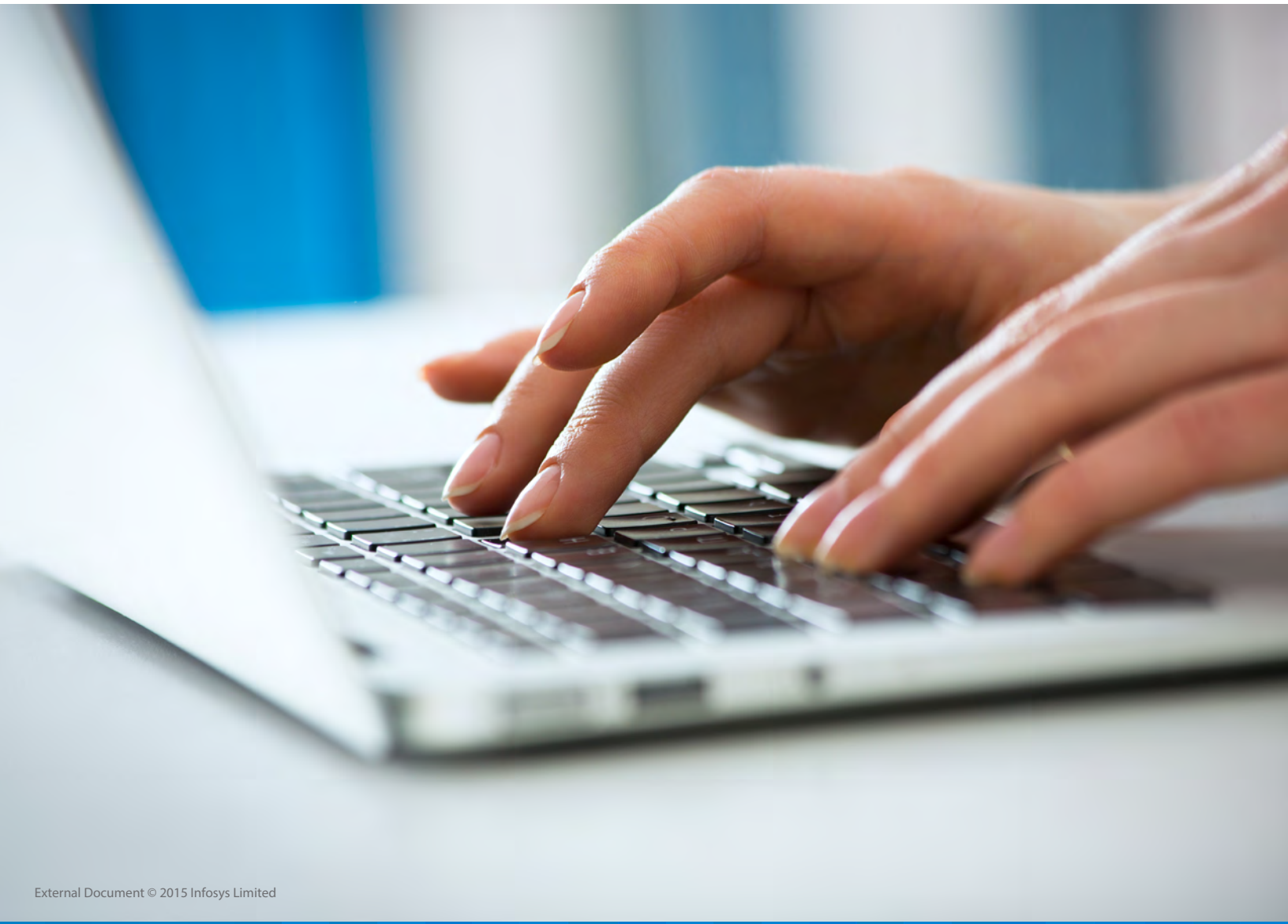
It is critical to implement analytics to harvest the power of big data from these smart assets. The challenge is in ensuring the information is collected efficiently and accurately, and brought together in real-time to help make the right decisions regarding the operation, maintenance, overhaul and replacement of assets. The key is in managing the intersection of the physical and the virtual to achieve a smart factory that collects data from multiple assets, processes and systems across the factory floor and generates integrated, real-time insights.

Companies that can master the emerging discipline of information management, to make insightful operational, tactical or strategic decisions, can reap significant rewards and differentiate themselves from their competitors. They are the ones who know the value of technology in amplifying their existing potential.

The Internet of technologies

The Internet of technologies and six associated Industry 4.0 design principles are clearly the significant change agent here. The design principles of Industry 4.0 – the German-led model for how to implement cyber-physical systems – provide a benchmark for enterprises embarking on this journey.

- **Interoperability:** the ability of cyber-physical systems (i.e. work piece carriers, assembly stations and products), humans and smart factories to connect and communicate with each other via the Internet of Things and the Internet of services
- **Virtualization:** a virtual copy of the smart factory which is created by linking sensor data (from monitoring physical processes) with virtual plant models and simulation models
- **Decentralization:** the ability of cyber-physical systems within smart factories to make decisions on their own
- **Real-time capability:** the capability to collect and analyze data and provide the derived insights immediately
- **Service orientation:** offering of services (of cyber-physical systems, humans or smart factories) via the Internet of services
- **Modularity:** flexible adaptation of smart factories to changing requirements by replacing or expanding individual modules.



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These design principles provide a framework that enable intelligent devices or cyber-physical systems to interoperate with each other across an enterprise or the entire value chain. And perhaps the most exciting element for industrial manufacturers is the ability to collect and analyze data and provide a single accurate view of the derived insights in real-time.

The result is that there is now live data transparency available to every stakeholder in the value chain of command. In essence, the shop floor has now transformed to the top floor. And with it comes a new level of competitive advantage: real-time decision-making. Real-time visibility of factory and equipment conditions enables enterprises to improve operational efficiency and complete strategic maintenance that reduces equipment and process downtime. Supply chains become more flexible and align themselves based on real-time changes in demand and production capacity.

Making the invisible visible

Almost every process and activity in an asset intensive today involves data. Additionally, the rapid adoption of 'smart assets' leads to the generation of more data than at any other time. But having data alone does not mean better information, or more informed business decisions. In fact much of this data goes unused. And worse still, some think that bad data is worse than no data at all.

So despite the apparent explosion in the generation of data it appears that, at the management level, executives are not confident that they have enough correct, reliable, consistent and timely data upon which to make decisions.

Asset-intensive enterprises need the right KPIs to operate effectively and with impact. For many organizations, this is where the rubber meets the road and the right KPIs can be used to measure the performance of those critical elements that impact asset performance and maintenance cost. Central to this is a KPI tree, the intention of which is to build a set of realistic, practical and integrated metrics that drive meaningful change.

Significantly, KPIs also create alignment across the entire interconnected plant support system. These indicators explain some of the fundamental aspects such as uptime, downtime, safety (number of incidents), environment (number of releases), and production (comparison of actual versus targeted production output).

These measures are also essential to understanding the efficiency and effectiveness of all assets, how optimally the assets are being managed, and their condition. And these metrics, if well chosen, will be catalysts for change. They can provide warning signals to identify ineffective or failed asset performance strategies.

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So it's not only a challenge to select the right indicators, but also to make sure they are aligned to meet strategic goals. Selecting the right measures is vital for effectiveness.

Embrace technology to enhance visibility

It is therefore critical to harvest the power of big-data from these smart assets. Lack of real-time visibility into shop floor processes is one of the biggest challenges for the manufacturing enterprise of today. A recent survey conducted by Infosys in conjunction with the Institute for Industrial Management (FIR) at RWTH Aachen in Germany reveals only 13 percent of manufacturers have a real-time visibility of their manufacturing processes. A significant percentage of them spend most of the day on so-called 'need-based' activities, simply looking for equipment and product details, which is a non-value-added process resulting in significant waste. Most manufacturers are just starting to embrace the value of cyber-physical systems which is the fundamental aspect of the next industrial revolution.

Today's technologies can save an organization millions of dollars a year by providing a real-time and true visibility across the manufacturing value chain. They can process and report assembly floor data in real-time to anyone in intelligent and customized dashboards. Processes that used to take hours to fix now take minutes to identify the issue and resolve problems owing to the immediate transparency of information. The cost-saving possibilities are endless and exciting. And we can go one step further. Consider the power and influence of ideally crafted analytics in a super-connected world – where the Internet of technologies holds sway. Amplifying today's shop floor with the power of visualized data and analytics is proving truly transformational.

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The Infosys difference

Infosys collaborates with partners, academic research institutes and customers alike to enhance real-time factory visibility and enable processes to be streamlined, cost-effective, and with enhanced efficiency and productivity. The factory visibility tools from Infosys are created as end-to-end solutions. That's extremely important in any enterprise where executives want to have at their disposal the whole picture of the assembly line or manufacturing environment. Infosys has helped customers to implement smart new factory visibility, enabled by data technologies and world-class visualizations, which are making the shop floor to top floor vision a reality.

Some recent highlights include:

- Implementation of real-time plant visibility for one of the largest food and beverage business in the world. This included real-time capture of production data from floor equipment and systems, integration of manufacturing systems, shop floor historian (recording trends and historical information about industrial processes for future reference), and the building of intelligent dashboards and real-time and historical performance reporting. This visibility delivered significant improvement in the overall line and plant effectiveness of 45% to 60%, which positively impacted plant throughput and profitability. In addition, it reduced the dependence on paperwork and manual effort by over 70%, as well as enabled the enterprise to entirely remove data duplication which had been a major concern.
- Implementation of a real-time information management system for a global mining company. This included instituting real-time visibility across the mining value chain – extraction, transportation, beneficiation and processing. Infosys defined and deployed a set of new global KPIs and was involved in the continuous improvement of the application landscape through the replacement of legacy applications. A critical element in this programme was KPI standardization across similar operations. In addition, adapted business critical systems were moved to newer converters without disrupting business continuity. The customer benefitted from a more stable platform for existing quality system operations, and enhanced visibility through its new Integrated Dashboard for Managers and Supervisors – making visibility from the shop floor to the top floor a reality.
- Implementation of an integrated manufacturing information management system for a global pharmaceutical and innovative healthcare products company. This included development of an intelligent dashboard and reporting system, integration and interoperability with multi-vendor systems, databases and manufacturing systems and multiple other plant level databases. This system was implemented across five production facilities spread across the world. This integrated manufacturing environment significantly improved operator efficiency due to automated data capture.

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About the Authors

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